

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Experimental Visualization of Singlet and Triplet Photovoltaic Processes in Organic Solar Cells HUIDONG ZANG, University of Tennessee

— This presentation will report the singlet and triplet photovoltaic processes in organic solar cells based on the studies of magnetic field dependence of photocurrent. We found that magnetic field dependence of photocurrent can be used to experimentally visualize the singlet and triplet photovoltaic processes in polymer bulk-heterojunction solar cells based on poly[3-methylthiophene] (P3HT) and surface-functionalized fullerene 1-(3-methyloxycarbonyl)propyl(1-phenyl [6,6] C61 (PCBM). We observed that singlet and triplet excitons undergo two different channels: dissociation and charge reaction, respectively, in the generation of photocurrent in organic semiconductors. When bulk-heterojunctions are formed between donor and acceptor molecules in organic solar cells, the weak donor-acceptor interaction mainly affects the dissociation channel but has little influence on charge reaction channel. Moreover, the strong donor-acceptor interaction can directly separate the electrons and holes in singlet and triplet excitons to generate photocurrent before they experience dissociation and charge reaction. Furthermore, the magnetic field dependence of photocurrent clearly indicates that the dissociated electrons and holes can recombine into charge-transfer complexes at the donor-acceptor intermolecular interfaces. This presentation will discuss the control of useful and non-useful photovoltaic processes based on the studies of magnetic field effects of photocurrent.

Bin Hu
University of Tennessee

Date submitted: 20 Nov 2009

Electronic form version 1.4